

Taxonomic Studies of *Bistorta* (Polygonaceae) in the Himalayas and Adjacent Regions (3)

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Bistorta griffithii and *B. suffulta* are taxonomically revised. *B. griffithii* is similar to *B. amplexicaulis* and *B. henryi* in the rhizome form, but differs from them in the position of articulation on the pedicel. *Polygonum griffithii* is confirmed as a valid name preceding a conspecific *P. calostachyum*. *B. suffulta* subsp. *pergracilis* (= *Polygonum suffulta* var. *pergracile*) is reduced into *B. suffulta* var. *suffulta*. *Polygonum suffultoides* A. J. Li recently described from Yunnan of southwestern China is reduced to a variety of *B. suffulta*.

Key words: *Bistorta*, Himalayas, taxonomy.

1. *Bistorta griffithii* (Hook. f.) Grierson

Bistorta griffithii (Hook. f.) Grierson, distributed in the alpine regions from Bhutan to southwestern China, is characterized by its horizontally elongated, often branched thick woody rhizome, pendulous inflorescences and long pedicels of flowers articulated near the middle. Similar rhizomes are observed in *B. amplexicaulis* and *B. henryi* (Yonekura and Ohashi 2002). However, the cauline leaves of the latter two have short undeveloped leaf sheathes as well as elongated ochreae, which are common in the other genera of Persicarieae but exceptional in the genus *Bistorta*. *Bistorta griffithii* has cauline leaves with well-developed leaf sheathes and short ochreae which are common in this genus. The latter features of the cauline leaves are not observed in the outgroups of *Bistorta* in Persicarieae and are considered to be advanced characters (Yonekura and Ohashi 2002). Pedicels articulated at the middle part are found only in *B. griffithii* in the genus *Bistorta*, while all other species

have pedicels articulated at the apex. Such characteristic pedicels are found only in a few species in *Aconogonon* within the tribe Persicarieae (Ronse Decraene and Akeroyd 1988), but are common in some genera in tribes Polygoneae and Rumiceae, such as *Fallopia* and *Rumex*. This character is associated with the perianth accrescent and covering an achene at fruiting stage. The adaptative nature of these characters remain unknown.

Polygonum griffithii Hook. f. was named based on a poor specimen with two scapes with nodding inflorescence-rachises without flowers and four radical leaves collected by Griffith in Bhutan (Fig. 1). Hooker (1886) placed it in 'doubtful and imperfectly known species' in the genus in his Flora of British India and thus this name has long been ignored. Diels (1912) described *P. calostachyum* Diels based on a flowering specimen collected by Forrest from northwestern Yunnan in southwestern China, although he mentioned that his new species



Fig. 1. Holotype of *Polygonum griffithii* Hook. f. (Griffith 637, K).

might be identical with *P. griffithii*. This name has been adopted in Chinese and Himalayan floras except Grierson and Long (1982, 1983) and Li (1983, 1993). Recently Li (1998) regarded *P. griffithii* as illegitimate and reverted to *P. calostachyum* instead.

However, the name *P. griffithii* was valid because it was clearly adopted by the author when it was published, and requirements for legitimate publication were fulfilled. After comparing the holotypes of *P. griffithii* and *P. calostachyum* we came to a conclusion

that the two species were identical to each other. As the former name was valid and legitimate, it has a priority. Miyamoto (2002) considered *Bistorta griffithii* and *B. calostachya* as different species and described the inflorescence of the latter as erect, but the inflorescence of the holotype of *Polygonum calostachyum* is clearly drooping as illustrated in Fig. 3 and identical with *B. griffithii*.

Bistorta griffithii grows in the alpine zone of the highly humid region in the Himalayas from Bhutan to Northwestern Yunnan (Fig. 2). This species is variable in leaf shape, inflorescence length and flower size but variation in such characters is reticulate and does not show any geographical clines. A specimen from Bhutan (Ludlow et al. 19141, BM) has especially thin inflorescences and smaller flowers, but in other respects it is

identical with *B. griffithii*.

Bistorta griffithii (Hook. f.) Grierson in Notes Roy. Bot. Gard. Edinburgh **40**: 128 (1982); Grierson & D. G. Long, Fl. Bhutan **1**(1): 168 (1983); Miyam. in S. Akiyama & al. in Bull. Natn. Sci. Mus. Tokyo ser. B, **28** (3): 80 (2002) (Fig. 3).

Polygonum griffithii Hook. f., Fl. Brit. India **5**: 54 (1886); A. J. Li in C. Y. Wu, Fl. Xizang. **1**: 613, fig. 194; 1, 2 (1983), in W. T. Wang, Vasc. Pl. Hengduan Mts. **1**: 362 (1993); T. Y. Ding, Fl. Yunnan. **11**: 340 (2000).

Type: **Bhutan**: on rocks above Sanah, 9500–10000 ft. (W. Griffith 637, not dated but possibly in 1843, K–Holotype !).

Polygonum calostachyum Diels in Notes Roy. Bot. Gard. Edinburgh **5**: 261 (1912); Sam. in Hand.-Mazz., Symb. Sin. **7**: 175

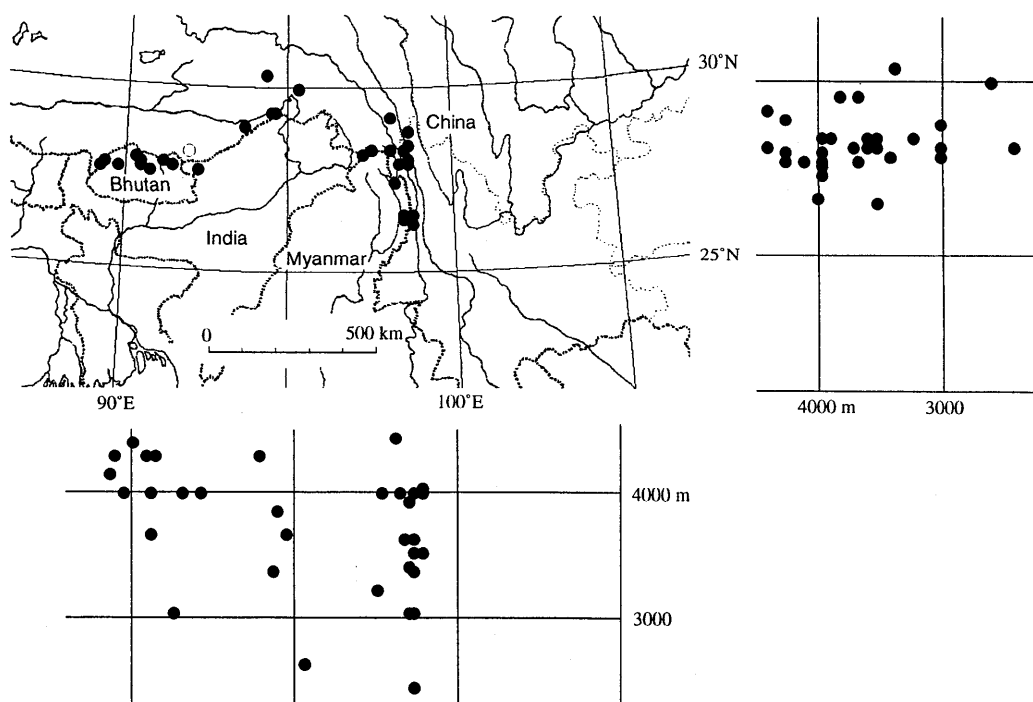


Fig. 2. Distribution of *Bistorta griffithii*. Solid symbols based on specimens examined, open ones based on literature records.

(1929); Steward in Contr. Gray Herb. **88**: 34 (1930); C. Y. Wu, Index Fl. Yunnan. **1**: 269 (1984); A. J. Li, Fl. Reipubl. Pop. Sin. **25**(1): 46 (1998).

Type: **China**: Yunnan, Moist mountain meadows on the eastern flank of the Mekong–Salwin divide, 28°N, 9–11000 ft. (G. Forrest 241, Sep. 1904, E–Holotype !).

Bistorta calostachya (Diels) Sojok in Preslia **46**: 152 (1974); Miyam. in S. Akiyama & al. in Bull. Natn. Sci. Mus. Tokyo ser. B, **25**(4): 152 (1999).

Polygonum kermesinum Kingdon–Ward in Trans. Bot. Soc. Edinburgh **27**: 26 (1916), nom. nud.

Gynodioecious perennial herb. Rhizome horizontally elongate, long-creeping, thickened, often branched, covered with fibrous remains of old leaf sheathes, probably reddish purple inside when fresh. Radical leaves several, 8–36 cm long; blades elliptic to oblong or ovate, 5.5–21 cm long, 1.8–6 cm wide, acute or sometimes acuminate at apex, cuneate or weakly cordate at base, green and lustrous above, opaque and paler beneath, glabrous on both surfaces or pubescent beneath, margin entire, eciliate and slightly revolute, veinlets reticulate, raised above, especially near margin; petioles 2.5–15 cm, wingless. Stems erect, 19–58 cm tall, pale green or reddish at upper half, simple or sometimes with short leafless or 1-leaved branches from upper nodes; cauline leaves 2–4 (–7), lower and middle ones shortly petiolate, ovate or broadly ovate, 5–9 cm long, 2–3.6 cm wide, acute or acuminate at apex, truncate or cordate at base; upper ones subsessile, smaller, sometimes amplexicaul. Leaf sheathes tubular, 8–10 mm long in the middle cauline leaves; 4–5 mm in the upper ones; ochreae pale brown, hyaline, as long as leaf sheath in upper cauline leaves. Inflorescences pendulous, (1.4–) 3.3–11.8 cm long, 1.6–2.8 cm thick, racemose, bearing one flower on each node; bracts below the middle of inflorescence triangular-ovate, 6–7.5

mm long, hyaline, apiculate at apex; pedicels (4.3–) 7–8.5 mm long, articulated at middle, below articulation (1.3–) 3–5.3 mm long, filiform. Flowers hermaphrodite or female on the base of inflorescences or rarely all flowers female, probably protogynous. Perianths (4.5–) 5–7 mm long, campanulate; tepals 5, ovate, 4.5–5.8 mm long, 2–2.5 mm wide, ovate, 3–5-nerved, pink to red or reddish purple. Stamens 8, filaments pink; anthers usually slightly exserted from perianths, dark purple. Styles 3, slightly exserted from perianths, 2.5–4 mm long, pink, almost free; stigmas capitate; ovary narrowly oblong, trigonous, 1.6–2 mm long. Achenes trigonous, narrowly oblong at lateral view, 4–5.2 mm long, 0.9–1.4 mm thick, brown, lustrous, shortly beaked at apex. Flowering season: Jun.–Oct.

Distribution and habitat: Bhutan, northeastern India, northern Myanmar (Burma), southwestern China (southeastern Tibet (Xizang) and northwestern Yunnan). Highly humid alpine grasslands, rocky ridges, forest margins. Locally abundant. Alt. 2400–4500 m. (Fig. 2)

Additional specimens examined. **Bhutan**: Biaka, Pumthang, 12000 ft. (Cooper 4770, BM, E); Chomolhari, Chakan, 4250 m (Nishioka s. n., 6 Sep. 1966, TI); Dingla, 12600 ft. (Cooper 4407, BM, E); Jiu La, Dhurchu, 14–15000 ft. (Ludlow & al. 19807, BM); Pangotang Tsampa, 14000 ft. (Ludlow & al. 19715, BM, E); ibid., 13000 ft. (Ludlow & al. 19141, BM, E); Parshong, Timpu, 13000 ft. (Cooper 1988, BM, E); Saga La, Upper Mangde Chu, 15000 ft. (Ludlow & al. 16848, BM, E); Shingbe (Me La), 13000 ft. (Ludlow & al. 20385, BM, E); Taglung La, Paro Chu, 13500 ft. (Ludlow & al. 17482, BM, E); Toregong, Pumthang, 14000 ft. (Cooper 2258, E).

India: Arunachal Pradesh, Orka La, Bhutan Frontier: Assam Himalaya, 12–14000 ft. (Kingdon–Ward 13714, BM).

China: Tibet (Xizang): Kongbo Prov., Deyang La, 12500 ft. (Ludlow & al. 15085, BM, E); Lusha Chu, 29°27'N, 94°35'E, 12000 ft. (Ludlow & al. 4778, BM, E); Tse La, Langong, 28°45'N, 94°00'E, 14000 ft. (Ludlow & al. 5630, BM, E); Pome Prov., Lisum, Nunkhu, Pu Chu Valley, 11000 ft. (Ludlow & al. 13771, BM, E); Showa Dzong, 8500 ft. (Ludlow & al.

13097, BM, E); Tsarung Prov., Mt. Wuli-la, high mountain east of the Salwin River and north of Alulaka, 14500 ft. (Rock 22363, BM, E, GH, K, NY; Rock 22413, E, GH, K). Yunnan Prov.: sine loco spec. (Forrest 16054, E; Forrest 30451, BM, E; T. T. Yü 8825, A); NW Yunnan and E. Tibet, sine loco spec., 13–14000 ft. (Kingdon-Ward 571, E); Gongshan Co. (Champutung): Lungpanla, 3000 m (C.W. Wang 67439, A); Salwin–Kiukiang Divide, Parolaka, 3400 m (T. T. Yü 20638, A, E); upper Kiukiang Valley, (Clulung) Chialahmuto, 3600 m (T. T. Yü 19724, A, E); Degen Co. (Atuntze): 3000 m (C. W. Wang 64817, A); Dokerla, 3900 m (T. T. Yü 7915, A, BM); Mountains above Tseku and Tsehchung, Mekong–Salween watershed (Rock 10059, E); Tse-kou (Monbeig s. n., A, K–Paratype of *Polygonum calostachyum* Diels, NY); *ibid.*, 2400 m (Monbeig 251, P); Mekong–Salwin divide, 28°10'N (Forrest 13289, BM, E); *ibid.*, 28°12'N. (Forrest 14237, BM, E); Sila, 3400 m (T. T. Yü 22411, A, E); *ibid.*, 3700 m (T. T. Yü 22144, A, E); Huann-fu-ping, 3500 m (C. W. Wang 69054, A); *ibid.*, 3600 m (C. W. Wang 68995, A); Mt. Miyetizimu, 3500 m (T. T. Yü 8662, A, BM, E); Fugong Co.; Fuchuan Range, west of the Mekong–Salwin divide and west of Wei-hsi, 13000 ft. (Rock 22747 & 23259, E, GH, NY); Fu Ch'uan Mt. (McLaren's Collector 'D' 315, BM, E); Bijiang Co. (Che-tse-lo): Pi-lo-shan, 4000 m (H. T. Tsai 58592, A); top of Pi-lo-shan, 4000 m (H. T. Tsai 58183, A); Zhiziluo (Chih-tse-lo), 3500 m (H. T. Tsai 54155, A); Mekong–Salwin divide, 26°20'N (Forrest 18344, Jul. 1919, BM, E).

MYANMAR (Burma): Imaw Bum, 13000 ft. (Kingdon-Ward 3394, E); Nam Tamai Valley. (Ka Karpo Razi), 28°15'N, 97°30'E, 12–14000 ft. (Kingdon-Ward 13394, BM); Sources of the Irrawaddy, Adung valley, 28°20'N, 97°40'E, 11–14000 ft. (Kingdon-Ward 9787, BM); Upper Burma, 26°30'N, 98°48'E, 13000 ft. (Forrest 26912, K); Valley of Naw-chaung, 11–12000 ft. (Kingdon-Ward 1916, E); western flank of the N'Maikha–Salwin divide, 26°30'N, 98°48'E, 13000 ft. (Forrest 26912, BM, E, NY); Valley of the Senighku, 28°08'N, 97°25'E, 10000–11000 ft. (Kingdon-Ward 7508, K); Western flank of the Chimi-li, N'Maikha–Salwin divide, 26°23'N, 98°48'E, 11000 ft. (Forrest 24938, E, K); Hpaushi Bum, 12400 ft. (RA 1057, E).

2. *Bistorta suffulta* (Maxim.) H. Gross with var. *suffultoides* (A. J. Li) Yonek. & H. Ohashi

Bistorta suffulta (Maxim.) H. Gross, described from Japan, is the only Sino-

Japanese element in the genus that reaches Sikkim through China and Bhutan (Fig. 4), is found almost exclusively on the floor of coniferous or deciduous broadleaved forests in upper montane and subalpine zone. This species has a very distinctive flowering mode; a pair of flowers at each node of the inflorescence develop in different stages, the second flower appears after the first has developed into a fruit (Fig. 5g). In other *Bistorta* species with two or more flowers at each inflorescence node the second flower appears when the first flower is still blooming. The flowering mode of this species results in a much longer flowering period than the other species in each inflorescence (1.5–2 months). In the early flowering period *Bistorta suffulta* has very short scapes with underdeveloped cauline leaves and short, sometimes nearly capitate terminal inflorescences (Figs. 5a, 6a). As stems, cauline leaves and inflorescences of *B. suffulta* elongate during its flowering period, this species in late flowering season shows greatly different appearance from that in spring (Figs. 5b, 6b). Our preliminary bagging experiment showed that the flowers of *B. suffulta* are possibly autogamous, because all bagged flowers on inflorescences set fruits without artificial pollination. *Bistorta suffulta* in early flowering period is somewhat similar to *B. tenuicaulis* var. *tenuicaulis* in Japan, but the two species are easily distinguished from each other by the flowering mode as well as the shape of radical leaves and number of cauline leaves (Yonekura and Ohashi 1998).

The rhizome of *Bistorta suffulta* is horizontally elongate, moniliform and often branched. Such form of the rhizome is observed only in Japanese *B. tenuicaulis* and *B. abukumensis* (Yonekura et al. 1995, Yonekura and Ohashi 1998) other than *B. suffulta*. Horizontally elongate and branched rhizomes are also found in *B. amplexicaulis* and *B. griffithii*, but those are more woody, cylin-



Fig. 3. *Bistorta griffithii*. a: Habit. b: Hermaphrodite flower, anthers fallen off. c: Female flower. d: Achene. Scale Bar: 2 cm for a; 2 mm for b–d. Voucher specimens: a, b: Forrest 241 (E; Holotype of *Polygonum calostachyum* Diels). c: Yü 8825 (E). d: Cooper 4770 (E).

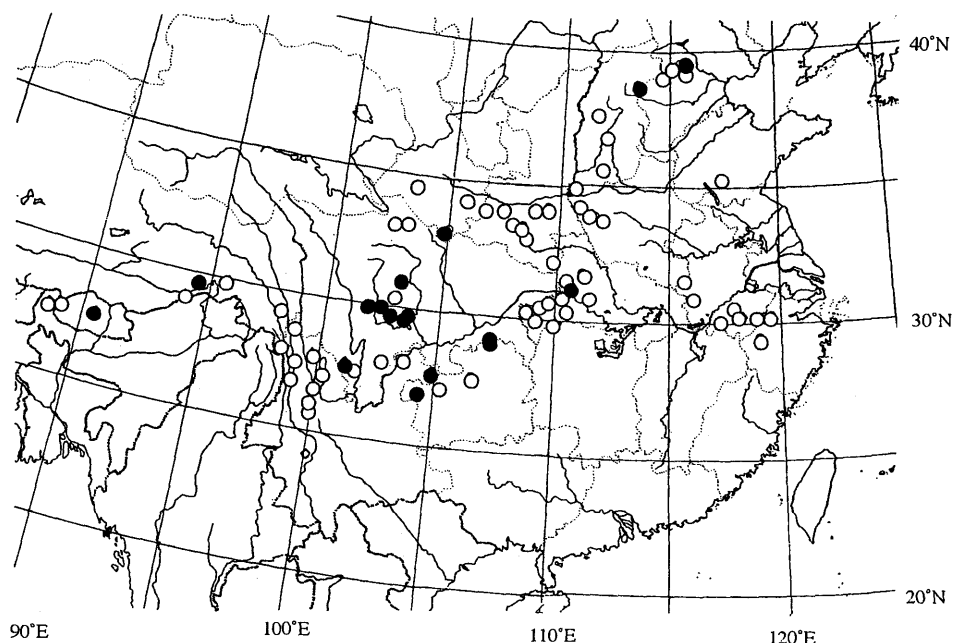


Fig. 4. Distribution of *Bistorta suffulta* in China and westward. The species is also distributed in Japan (Honshu, Shikoku and Kyushu) and Isl. Cheju in Korea. Solid symbols based on specimens examined, open ones based on literature records.

drical and never moniliform. Petrov (1928) founded a subgenus *Bistortella* Petrov based on its rhizome form and included *B. suffulta*, *B. tenuicaulis* and a few new species described by him in it. Although *B. suffulta* is more specialized in the mode of flowering than *B. tenuicaulis*, the two species might be related closely to each other.

Typical *Bistorta suffulta* in Japan and eastern China has a relatively short rhizome with condensed internodes and short, compact inflorescences (Fig. 5). In southwestern China the shape of rhizomes and inflorescences are variable and several variants have been recognized as infraspecific taxa or distinct species (Forbes and Hemsley 1891, Petrov 1928, Samuelsson 1929, Steward 1930). Plants from Tibet (Xizang) and Bhutan have very sparse, often much branched inflorescences and elongated remotely nodulose rhizomes (Fig. 6). They

have been regarded as a distinct subspecies or varieties of *B. suffulta* or recognized as distinct species such as *Polygonum pergracile* Hemsl., *Bistorta pseudosuffulta* Petrov, etc. Plants from the Sichuan Province of southwestern China, however, show very wide variation in inflorescences and in rhizomes which are hardly correlated. In Mt. Emei (Omei), type locality of *P. pergracile*, plants with dense-flowered inflorescences and those with sparse ones are found in adjacent habitats. Plants recognized by Samuelsson (1930) as *P. suffultum* var. *rufescens* Franch. have densely flowered inflorescences and elongated rhizomes, which are intermediate between typical *B. suffulta* and *P. pergracile*. Plants with elongated rhizomes are sporadically collected in Japan, especially plants growing in humid places (e. g. Sasaki s. n. from Miyagi Prefecture, TUS 124859). The characters used

by Petrov (1928) to distinguish several species in China from *B. suffulta*, such as leaf margin, inflorescence shape, colour and hairiness of leaves, are too variable and unreliable for distinction. Although more widespread studies in southwestern China are needed to reveal variation patterns of these characters at population level, we regard all infraspecific taxa hitherto recognized within this species as indistinguishable.

Li (1995) described *Polygonum suffultoides* A. J. Li from northwestern Yunnan based on its viviparous inflorescences. Discovery of this species is very interesting as *Bistorta vivipara* (L.) Delabre had been known as the only viviparous species in Polygonaceae. The examination of the holotype and additional specimens in PE (Fig. 7) revealed that the bulbil position in inflorescences and morphology of bulbils of *P. suffultoides* are very similar to those of *B. vivipara*. *Polygonum suffultoides* is, however, indistinguishable from *B. suffulta* in other characters. As *B. vivipara* (especially some variants found in Himalayas) is morphologically similar to *B. macrophylla* (Samuelsson 1929), but very different from *B. suffulta*, the viviparous nature of *B. vivipara* and *P. suffultoides* are probably acquired independently in *Bistorta*. Section *Vivipara* founded by Tzvelev (1987) based on *B. vivipara* is not worth recognizing. Although vivipary is a very rare phenomenon in Polygonaceae, it is found in many families of flowering plants and it seems insufficient for specific recognition unless other differences are correlated with it. We thus treat *P. suffultoides* as a variety of *B. suffulta*. It also throws some doubt on the distinctness of *B. vivipara* as a species from *B. macrophylla*. As *B. suffulta* var. *suffultoides* is known only from a few collections, further studies in its native habitats are strongly required especially regarding its variation in vivipary and isolation from var. *suffulta*.

Bistorta suffulta (Maxim.) H. Gross in Bull. Acad. Intern. Géogr. Bot. (Le Mans) **23**: 15 (1913), "(Maxim.) Greene"; Petrov in Bull. Jard. Bot. Princ. URSS **27**: 222 (1928); Nakai in J. Jpn. Bot. **14**: 738 (1938), cum auct. Greene; Kitag. in Satake & al., Wild Flow. Jap. Herb. Pl. **2**: 18, pl. 15–4 (1982), cum auct. Greene; Grierson & D. G. Long, Fl. Bhutan **1**(1): 167 (1983); W. T. Lee, Lineam. Fl. Kor. **1**: 213 (1996), cum auct. Greene; Yonek. & H. Ohashi in J. Jpn. Bot. **72**: 302 (1997); Miyam. in S. Akiyama & al. in Bull. Natn. Sci. Mus., Tokyo, ser. B, **25** (4): 154 (1999).

Polygonum suffultum Maxim. in Bull. Acad. Imp. Sci. St.-Petersb. **22**: 233 (1876), Mém. Biol. **9**: 616 (1876); Forbes & Hemsl. in J. Linn. Soc., Bot. **26**: 350 (1891); Dammer in Diels in Bot. Jahrb. Syst. **29**: 313 (1901); Diels in Notes Roy. Bot. Gard. Edinburgh **5**: 259 (1912); Sam. in Hand.-Mazz., Symb. Sin. **7**: 176 (1929), in Acta Hort. Gotoburg. **5**: 6 (1930); Steward in Contr. Gray Herb. **88**: 32 (1930); Ohwi, Fl. Jap.: 466 (1953); Kitam. & Murata, Col. Ill. Herb. Pl. Jap. 2(Choripet.): 303, pl. 64–573 (1961); A. J. Li in W. T. Wang, Vasc. Pl. Hengduan Mts. **1**: 362 (1993), Fl. Reipubl. Pop. Sin. **25**(1): 42, pl. 8; 3–6 (1998); T. Y. Ding, Fl. Yunnan. **11**: 337, tab. 94; 1, 2 (2000).

Syntypes: **Japan**: in summa jugi Hakone (C. J. Maximowicz s. n., May 1862, LE, n. v.); Nikko (P. A. L. Savatier 2919, P, LE, n. v.); Prov. Nambu, in silvis alpinis ad rivulos (Tschonoski s. n., ann. 1865, LE, n. v.).

Key to varieties of *Bistorta suffulta*

1. Inflorescences viviparous
.....var. *suffultoides*
1. Inflorescences not viviparous
.....var. *suffulta*

var. ***suffulta*** (Figs. 5, 6)

Polygonum suffultum Maxim. var.



Fig. 5. *Bistorta suffulta* (1). Plants in Japan. a: Habit at early flowering period. b: Habit at full-grown stage. c: Bract. d: Flower. e: Petianth; cut and spread out. f: Pistil. g: A node of inflorescence showing a flower at fruiting stage and a flower bud at the base of it. Scale bar: 5 cm for a and b; 8 mm for c–e, g; 4 mm for f. Voucher specimens: a: Takahashi 398 from Nagano Pref. (TUS). b: Sasaki s. n. from Miyagi Pref. (TUS). c–g: a cultivated material in the Experimental Garden, Tohoku University, originally collected Mt. Ryokami-san, Saitama Pref.

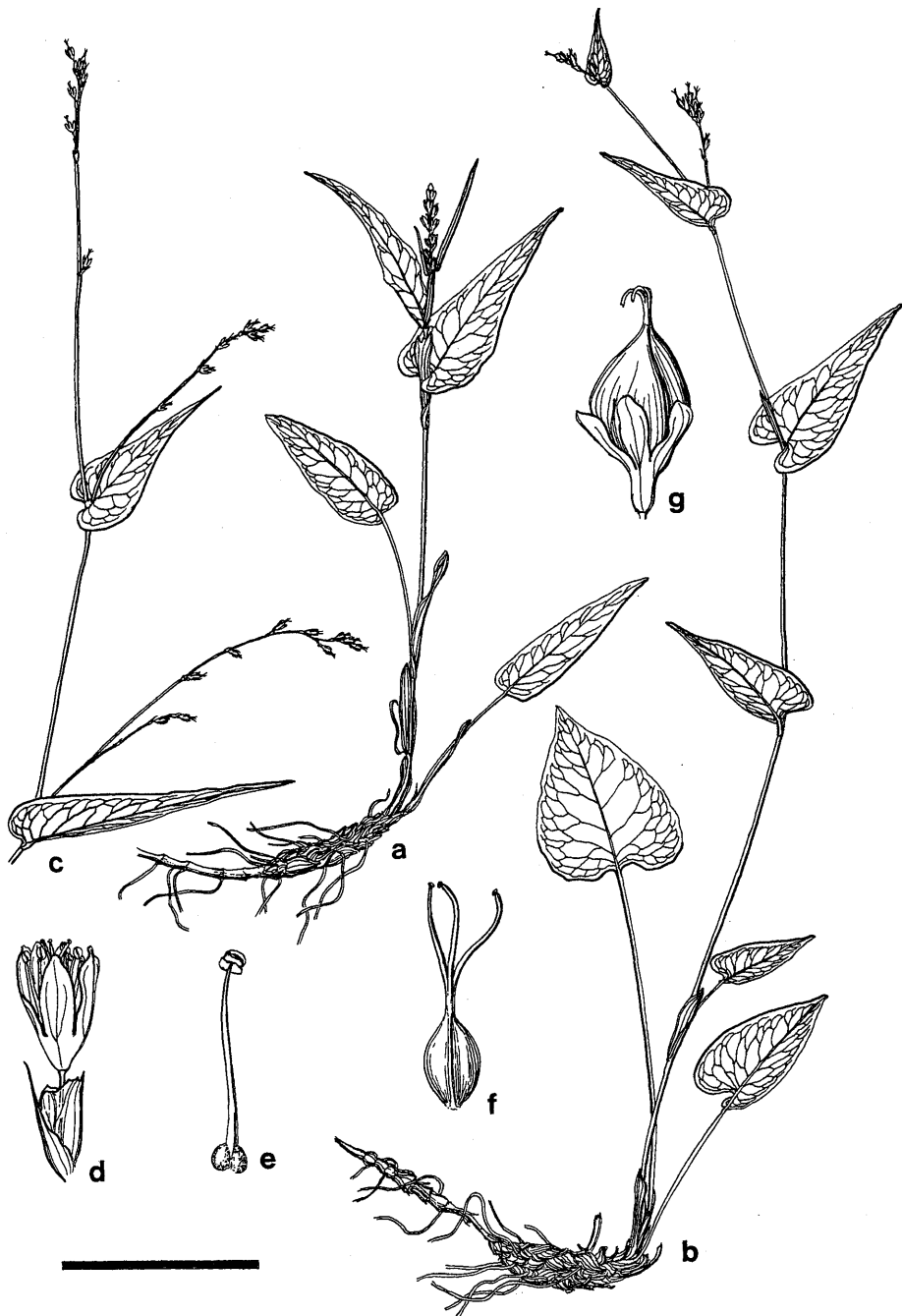


Fig. 6. *Bistorta suffulta* (2). Plants in Southwestern China and the Himalayas. a: Habit at early flowering period. b: Habit at full-grown stage. c: Upper part of stem at full-grown stage. d: Flower. e: Stamen with nectaries at base. f: Pistil. g: Achene with perianth. Scale bar: 4 cm for a-c; 8 mm for d, f and g; 4 mm for e. Voucher specimens: a, c, f: Naito & al. 1270 (TUS). b, d: Yü 6028 (PE). d: Grierson & Long 1837 (TI). g: Sun & Cheng 1079 (A).

rufescens Franch., Pl. David. **2**: 112 (1888); Sam. in Acta Hort. Gotoburg. **5**: 6, in textu (1930).

Type: **China**: Sichuan, Moupine, in montibus apricis (P. A. David s. n., Apr. 1869, P-Holotype, n. v.).

Polygonum pergracile Hemsl. in Forbes & Hemsl. in J. Linn. Soc., Bot. **26**: 344 (1891), "*pergracilis*"; Dammer in Diels in Bot. Jahrb. Syst. **29**: 313 (1901), "*pergracilis*"; C. Y. Wu, Index Fl. Yunnan. **1**: 278 (1984).

Type: **China**: Sichuan, summit of Mt. Omei (Faber s. n., K-Holotype, n. v.).

Bistorta pergracilis (Hemsl.) H. Gross in Bull. Acad. Intern. Géogr. Bot. (Le Mans) **23**: 19 (1913).

Polygonum suffultum var. *pergracile* (Hemsl.) Sam. in Hand.-Mazz., Symb. Sin. **7**: 176 (1929), in Acta Hort. Gotoburg. **5**: 6, in textu (1930); Steward in Contr. Gray Herb. **88**: 32 (1930); A. J. Li in C. Y. Wu, Fl. Xizang. **1**: 612, figs. 194–5, 195–6 (1983), in W. T. Wang, Vasc. Pl. Hengduan Mts. **1**: 362 (1993), Fl. Reipubl. Pop. Sin. **25**(1): 44 (1998); T. Y. Ding, Fl. Yunnan. **11**: 339 (2000).

Bistorta suffulta subsp. *pergracilis* (Hemsl.) Soják in Preslia **46**: 152 (1974).

Polygonum constans Cummins in Kew Bull. **1896**: 20 (1896); C. Y. Wu, Index Fl. Yunnan. **1**: 271 (1984).

Syntypes: **India**: Sikkim, Beroom, 3600 m (C. B. Clarke s. n., K, n. v.); **China**: Tibet (Xizang), Chumbi Valley (King's Collector s. n., K, n. v.).

Bistorta constans (Cummins) Petrov in Bull. Jard. Bot. Princ. URSS **27**: 223 (1928).

Polygonum marretii H. Lév. in Repert. Spec. Nov. Regni Veg. **8**: 171 (1910).

Syntypes: **Korea**: Isl. Cheju (Quelpaert), Mt. Hallaisan, alt. 1200 m (U. Faurie 2033, 17 May 1907, E, n. v.); *ibid.*, alt. 1000 m (T. Taquet 1297, 6 Jun. 1908, E, n. v., Isosyntypes-KYO!, TI!).

Polygonum limprichtii Lingelsh. in Repert. Spec. Nov. Regni Veg. Beih. **12**: 359

(1922).

Type: **China**: Sichuan, Tatsienlu (Limpricht s. n., WRS�-Holo, n. v.).

Bistorta maianthemifolia Petrov in Bull. Jard. Bot. Princ. URSS **27**: 221 (1928), "*majanthemifolia*".

Type: **China**: Gansu, "Kansu occidentali, circa monasterium Dshoni" (G. N. Potanin s. n., 2 Jun. 1885, LE-Holotype, n. v.; PE-Isotype!).

Polygonum maianthemifolium (Petrov) Steward in Contr. Gray Herb. **88**: 32 (1930), "*majanthemifolium*".

Bistorta franchetiana Petrov in Bull. Jard. Bot. Princ. URSS **27**: 224 (1928).

Type: **China**: Sichuan, inter vicos Err-doshoui et Da-dsian-lu (Tatsienlou) (G. N. Potanin s. n., 16 Apr. 1893, LE-Holotype, n. v.; PE-Isotype!).

Bistorta pseudosuffulta Petrov in Bull. Jard. Bot. Princ. URSS **27**: 225 (1928).

Type: **China**: Yunnan, eastern flank of the Lichiang Range, 27°12'N, 9–10000 ft. (G. Forrest 2186, May 1906, LE-Holotype, n. v.; E-Isotype, n. v.).

Bistorta suffulta f. *pubescens* Hiyama in J. Jpn. Bot. **17**: 5 (1941).

Syntypes: **Japan**: Yamanashi Pref. (Prov. Kai), Mt. Mitsutoge (K. Hiyama s. n., 10 Jun. 1934, TNS, n. v., Isosyntype-TI!); Saitama Pref. (Prov. Musashi), Mt. Kuro-mori (K. Hiyama s. n., 15 Jul. 1935, TNS?, n. v.).

Hermaphrodite perennial herb. Rhizome elongate horizontally, often branched, 4–17 mm thick, moniliform or rarely subcylindrical, if moniliform nodules densely or sparsely arranged, spherical, appressed-spherical or fusiform (in the most of the Himalayan specimens). Radical leaves unfolding during early spring period, petiolate, blades ovate, 1.5–6 cm long, 1.2–4 cm wide, obtuse at apex, truncate or subcordate at base, green above, paler or sometimes purplish beneath, entire at margin, petioles 1–6 cm long, wingless; those unfolding dur-

ing late flowering period larger, 10–31 cm long (including petioles), blades ovate, narrowly ovate or elliptic-ovate, 3–14 cm long, 2–9 cm wide, acuminate, acute or obtuse at apex, cordate or subtruncate at base, green above, paler, glabrous or pubescent beneath, entire, plain at margin, veinlets near margin papillose above, petioles 4–28 cm long, wingless. Stems 10–55 cm tall with 3–5 cauline leaves and with short branches from upper nodes when fully grown, ridged, often papillose on ridges as well as leaf sheathes, but in early flowering period often only 2–5 cm tall with cauline leaves and branches underdeveloped. Lower cauline leaves with petioles (0.5–) 1.5–8 cm long, blades ovate, narrowly ovate or triangular-ovate, 1.5–5 cm long, 1–3 cm wide, acute to obtuse rarely acuminate at apex, truncate to subcordate at base, often decayed at summer; ochreae with leaf sheathes 0.8–3.5 cm long, leaf sheathes weakly developed much shorter than ochreae; middle cauline leaves subsessile or (in some Himalayan specimens) with short petioles less than 1 cm long, blades ovate to narrowly ovate, 3–10 cm long, 1.5–5 cm wide, acute to acuminate at apex, cordate at base, often amplexicaul; upper ones similar to middle ones in shape but gradually smaller upwards, sessile and amplexicaul at base. Inflorescences terminal on stems and branches, unbranched or branched at base, conical, spherical or (in some Himalayan specimens) cylindrical in early flowering period, cylindrical when fully grown, 1–6 cm long, to 6 mm thick, densely or sparsely flowered; 2 flowers on each node of inflorescences, bud of the second flower in each node hidden in bracts until the first flower becoming fruit; bracts ovate or triangular-ovate, hyaline, 2–5.5 mm long, hyaline, acuminate; pedicels 0.8–2.5 mm long at flowering stage, to 3 mm at fruiting stage. Perianthes campanulate, pale pink or white, 2–3.3 mm long, to 3.8 mm long at fruiting stage, moderately to deeply 5-fid; tepals ob-

long to oblong-obovate, 1.5–2.5 mm long, obtuse at apex; stamens 8, subequal or slightly longer than tepals, filaments white, anthers red to reddish purple; styles 3, 1–2.1 mm long, basal 1/6–1/2 connate to each other, stigma capitate. Achenes exerted from perianthes, trigonous, broadly rhombic-elliptic or broadly ovate at lateral view, 2.6–3.4 mm long (including beaks), 1.5–1.8 mm diam, brown to pale brown, lustrous, apex with beaks 1/3–1 mm long. Flowering season: Apr.–Jul.

Distr.: Japan, Korea (Isl. Cheju), China (Hebei, Shanxi, Shaanxi, Zhejiang, Anhui, Jiangxi, Hunan, Hubei, Sichuan, Guizhou and Yunnan, Qinghai, Gansu and Tibet (Xizang)), Bhutan and India (Sikkim). Moist places under coniferous or deciduous broad-leaved forests, forest margins, rarely in alpine grasslands. Alt. 300–3800 m.

Specimens examined (numerous specimens from Japan and Korea are omitted; specimens with elongated inflorescences with sparse flowers are indicated by the asterisk). **Bhutan:** Bumthang Chu, Byakar, valley above Lami Gompa, 27°33'N, 90°42'E, 3100 m (Grierson & Long 1837, TI*).

China: Tibet (Xizang): Nyingchi Co., Bayi, hill at back of Agriculture and Animal Husbandry Institute of Xizang, 3000–3300 m (Naito & al. 1270, TUS*). Yunnan Prov.: Weixing Co., Tianxing Artificial Forest (Nemoto 1370, TI). Sichuan Prov.: Muli Co., Wa-chin, 2800 m (T. T. Yü 6028, PE-304299*); Tianquan Co., E. side of Mt. Erlangshan, 1700–2050 m (Naito & al. 109, TUS); *ibid.*, 2400 m (J. T. Wang & Y. Takeda 0674, PE*); Mt. Omei (C. L. Sun 1807, A); Mt. Omei, Tachengssu, 2300 m (H. C. Chow 9795, A); Dachengsi–Leidongping, 2450 m (K. C. Kuan & al. 403, PE 843013); Leidongping, 2500 m (Hara s. n., 5 May 1981, TI); Mt. Omei, Chilipo, 2540 m (S. C. Sun & K. Chang 1079, A); Dujiangyan, West of Kuan Hsien, 2900 m (F.T. Wang 20870, GH); Ta-hsiangling, 2000–2500 m (Smith 2140, KYO); Nanchuan Co., Zhuyunso, above mountain, 2000–2300 m (C. Z. Li & C. F. Zhang 004, PE 1264999); Nanchuan Co., Mt. Baimashan, Shimaofang, 1950 m (Jinfoshan Exped. 0613, PE 1373030). Hubei Prov., Xingshan, 1700 m (G. F. Tao & Q. D. Jiang s. n., KYO). Shanxi Co., Mt. Wutai-shan, Zhenghaisi (Tatewaki 1171, TI). Beijing, Xiaolongmen, Mentougouqu, 120 m (Z. T. Wang & al. 75, TUS).

var. **suffultoides** (A. J. Li) Yonek. & H. Ohashi, comb. et stat. nov. (Fig. 7)

Basionym: *Polygonum suffultoides* A. J. Li in Bull. Bot. Res. (Harbin) **15**: 415, fig. 3 (1995), Fl. Reipubl. Pop. Sin. **25**(1): 37 (1998); T. Y. Ding, Fl. Yunnan. **11**: 334, tab. 93; 1, 2 (2000).

Type: **China**: Yunnan, Deqen Co.,

[Bamzarag], in sylvis montium, alt. 3400 m (Qing-Zang Expedition 1846, 6 Jul. 1981, PE 1223711–Holotype!).

Different only from var. *suffulta* in its inflorescences viviparous below.

Bulbils on middle to upper leaf axils and a few lower nodes of inflorescences, 5.5–7 mm long, ca. 3 mm in diam, subtended by

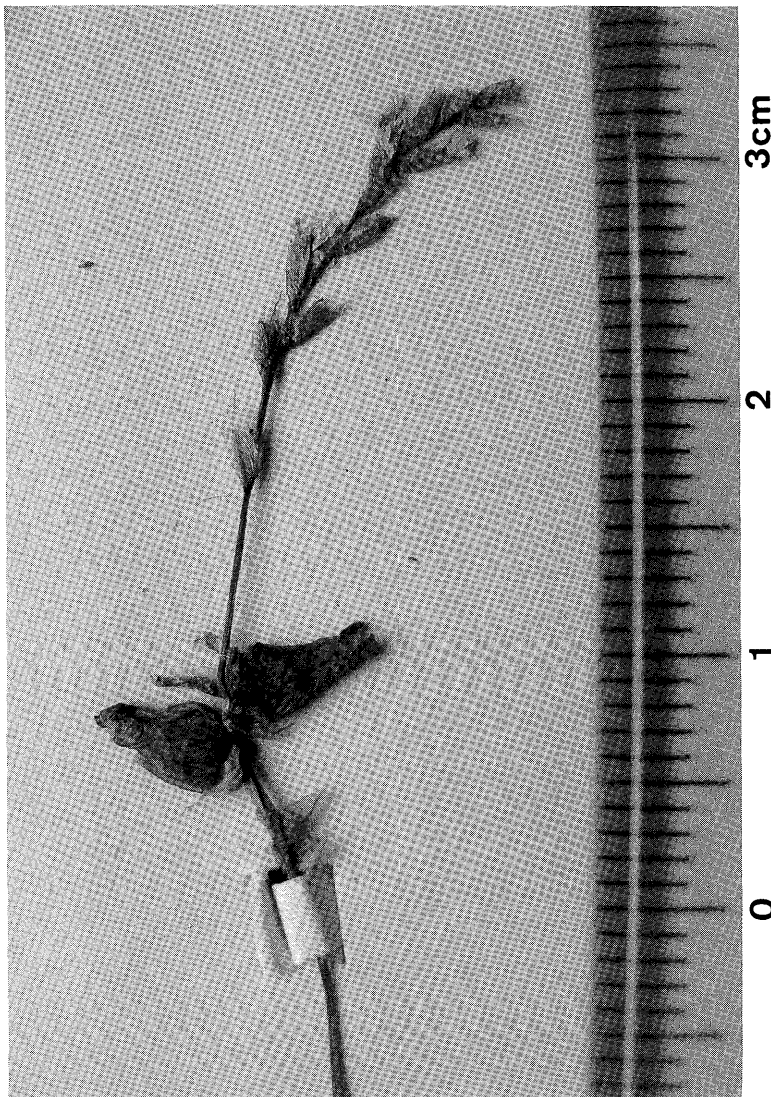


Fig. 7. Inflorescence of *Bistorta suffulta* var. *suffultoides* (= *Polygonum suffultoides*) with two bulbils (Qing-Zang Expedition 2171, PE).

1–2 hyaline bracteoles, very similar to those of *Bistorta vivipara*.

Distribution and habitats: Northwestern Yunnan (Degen, Zhongdian, Gongshan, Weixi, Lijiang), China. Forest floors at riversides, alpine grasslands. Alt. 3200–4500 m (fide Ding 2000).

Other specimen examined: **China**: Yunnan, Degen Co., Bamzarag, Yongzhongshan, 3200–3400 m (Qing-Zang Expedition 2171, PE 1225895).

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米倉浩司^a, 大橋広好^b: ヒマラヤと周辺地域のイブキトラノオ属植物 (タデ科) の分類学的再検討 (3)

Bistorta griffithii (Hook. f.) Grierson とクリンユキフデ *B. suffulta* (Maxim.) H. Gross の 2 種について検討を行った。ブータンからチベット東南部を

経て雲南省西北部まで分布する *B. griffithii* は、横に長く匍匐して分枝する木質の根茎を持つ点で *B. amplexicaulis* に似るが、托葉鞘が短く葉鞘がよく発達する点でより進化した位置にあるものと考え

られる。本種は小花柄の中部に関節がある点で（イブキトラノオ属の他の種では小花柄の頂部に関節がある）特徴的であり、このような特徴は遠縁と考えられるいくつかのタデ科の属では多く見られるがイブキトラノオ属の属するイヌタデ連では稀である。*B. griffithii* の基礎異名である *Polygonum griffithii* Hook. f. は、基準標本が不完全であったため疑問種として記載され、そのためしばしば無視されたか非合法名とされ、後に中国雲南省産の完全な標本に基づいて記載された *P. calostachyum* Diels がしばしば本種に対して用いられてきた。しかし、基準標本と原記載を検討した結果、*P. griffithii* の学名は明らかに著者によって受け入れられており、合法名であることは疑う余地がない。従って、*B. griffithii* が本種の正名となる。

クリンユキフデは、日本から中国中部を経てブータンやシッキムまで分布しており、本属の中では唯一の日華区系要素とみなされる。本種は花序の各節に2花をつけ、一方の花の開花結実後にもう一方の花が開花するという特徴を持つために花序当たりの開花期間が他種に比べて長く、茎や花序はその間も成長を続けるために、開花初期と後期では植物体の特徴が大きく異なって見える。本種も *B. griffithii* 同様伸長して分枝する根茎を持つが、木質化することではなく、一部の節が肥厚するため数珠状を呈する。このような特徴をもつ根茎は他に日本産のハルトトラノオ *B. tenuicaulis* やアブクマトラノオ *B. abukumensis* でのみ認められ、両者の類縁を示唆するものと考えられる。中国南西部からヒマラヤにかけて分布するクリンユキフデは、

花序が伸長してまばらに花をつけ、根茎の節間がより伸長して細長い点で日本産とは異なり、しばしば独立の変種（または亜種）とされてきた。しかし、中国の四川省周辺においては、花序の長さや根茎の伸長の度合いには著しい変異が認められ、しかもそれらは互いに必ずしも相関しておらず、また伸長した根茎をもつ個体が日本にも時に見られるので、このような型を区別しないのが妥当であると考えられた。

近年中国の雲南省北西部から記載された *Polygonum suffultoides* A. J. Li は、花序にムカゴトラノオ *Bistorta vivipara* (L.) Delabre のようなむかごをつける点で著しい特徴をもつが、それ以外の点ではクリンユキフデと全く区別できない。むかごをつけるという性質はタデ科ではこれらの種でのみ見られる稀な特徴であるが、いくつかの他の科ではより普遍的であり、むかごの有無だけで種を認識するのは極めて機械的であると考えられる。そこで、今回 *P. suffultoides* をクリンユキフデの変種に落としたが、この変種の分類学的実体に関してはさらに現地調査が必要である。本型の発見は、栄養器官がムカゴトラノオと酷似しており、むかごを欠くことだけで認識される *B. macrophylla* (D. Don) Soják の種としての独立性にも疑問を投げかけるものである。

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